

## CLAIMS:

1. Method for driving a gas discharge lamp (2) with an alternating current, the method comprising the steps of:

- generating a positive lamp current ( $I_P$ ) with a positive current intensity ( $|I_P|$ ) for a positive duration ( $\tau_P$ );

5 - changing the direction of the lamp current;

- generating a negative lamp current ( $I_N$ ) with a negative current intensity ( $|I_N|$ ) for a negative duration ( $\tau_N$ );

wherein a duty cycle ( $D = \tau_P / (\tau_P + \tau_N)$ ) differs from 50%;

and wherein a current ratio ( $R = |I_P| / |I_N|$ ) differs from 1.

10

2. Method according to claim 1, wherein the average current ( $I_{AV}$ ) is substantially equal to zero.

3. Method according to claim 1, wherein a lamp characteristic is changed by changing the duty cycle ( $D$ ) and the current ratio ( $R$ ), while the average current ( $I_{AV}$ ) is maintained at a constant value.

15

4. Method according to claim 3, wherein the constant value of the average current ( $I_{AV}$ ) is substantially equal to zero.

20

5. Method according to claim 3, wherein the duty cycle ( $D$ ) and the current ratio ( $R$ ) are changed substantially simultaneously.

6. Method according to claim 3, wherein the duty cycle ( $D$ ) is changed in response to a user command, wherein the average current ( $I_{AV}$ ) is measured, and wherein the current ratio ( $R$ ) is changed in order to effectively maintain the average current ( $I_{AV}$ ) at its constant value.

25

7. Method according to claim 3, wherein the current ratio (R) is changed in response to a user command, wherein the average current ( $I_{AV}$ ) is measured, and wherein the duty cycle (D) is changed in order to effectively maintain the average current ( $I_{AV}$ ) at its constant value.
- 5
8. Method according to claim 3, wherein, in response to a user command, the current ratio (R) and the duty cycle (D) are changed in combination while obeying a predetermined relationship between the current ratio (R) and the duty cycle (D).
- 10 9. Method according to claim 3, wherein, in response to a user command, the current ratio (R) and the duty cycle (D) are changed on the basis of information from a memory.
- 15 10. Electronic driver (1) for driving a gas discharge lamp, the driver being designed to perform the method of any of claims 1 - 9.
11. Method for driving a gas discharge lamp, specifically a HID lamp, more specifically a metal halide lamp, most specifically a metal halide lamp with an aspect ratio larger than 3 or even 4, wherein the lamp is supplied with a commutating DC current;
- 20 - the method comprising the step of setting the duty cycle (D) to a value differing from 50% and setting the current ratio (R) to a value differing from 1 such as to obtain a desirable particle distribution inside the lamp.
12. Method according to claim 11, wherein a combination of duty cycle (D) and
- 25 current ratio (R) is set such that the commutating current has an average current intensity equal to zero.
13. Method according to claim 11, wherein the combination of duty cycle (D) and current ratio (R) is varied in order to vary the efficacy of the lamp and/or to vary the color
- 30 temperature of the lamp.
14. Method according to claim 13, wherein the combination of duty cycle (D) and current ratio (R) is varied such that the average current intensity of the commutating current is substantially constant.

15. Method according to claim 13, for operating a lamp such that the efficacy is substantially orientation-independent and wherein the actual orientation of the lamp is determined.
- 5 16. Method according to claim 11, wherein the lamp is arranged in a vertical orientation, and wherein the combination of duty cycle (D) and current ratio (R) is set such as to reduce, and preferably eliminate, segregation.
- 10 17. Method according to claim 11, wherein the combination of duty cycle (D) and current ratio (R) is set such as to increase segregation.
18. Method according to claim 11, wherein the lamp is arranged in a horizontal orientation, and wherein the combination of duty cycle (D) and current ratio (R) is set such  
15 that a shift of the particle distribution is effected, to vary the lamp efficacy and/or to vary the color temperature of the lamp.
19. Method according to claim 11, wherein the lamp is arranged in a horizontal orientation, and wherein the combination of duty cycle (D) and current ratio (R) is set such  
20 that a shift of the particle distribution is effected, setting a color point on a color line at a position differing from a horizontal zero color point.
20. Method according to claim 11, wherein the lamp is arranged in a vertical orientation, and wherein the combination of duty cycle (D) and current ratio (R) is set such  
25 that a shift of the particle distribution is effected, setting a color point on a color line at a position differing from a vertical zero color point.
21. Method according to any of claims 19 or 20, wherein the combination of duty cycle (D) and current ratio (R) is varied in order to make the color point travel said color line.
- 30 22. Method according to claim 21, practiced on a high-pressure lamp (above 10 atm) arranged in a horizontal orientation, wherein the color temperature is varied over a range having a width in the order of about 1500-2000 K.

23. Method according to claim 21, practiced on a high-pressure lamp (above 10 atm) arranged in a vertical orientation, wherein the color temperature is varied over a range having a width in the order of about 2500 - 3000 K.
- 5 24. Driving apparatus for driving a gas discharge lamp, specifically a HID lamp, more specifically a metal halide lamp, most specifically a metal halide lamp with an aspect ratio larger than 3 or even 4, according to the method as claimed in any of claims claim 1 to 9 or 11 to 23, the apparatus comprising:
- current generating means for generating a current;
  - 10 - commutating means for receiving said current, and having an output for connecting to a lamp, the commutating means being arranged for commutating said current with a duty cycle differing from 50% and a current ratio (R) differing from 1.
25. Driving apparatus according to claim 24, the commutating means being  
15 arranged for maintaining the average current intensity equal to zero.
26. Driving apparatus according to claim 24, wherein the commutating means are arranged for commutating said current with a variable duty cycle.
- 20 27. Driving apparatus according to claim 26, the commutating means being arranged for maintaining the average current intensity constant.
28. Driving apparatus according to claim 26, wherein the driver further comprises a control input for receiving a control signal, and wherein the driver is responsive to a control  
25 signal received at its control input to set the combination of duty cycle (D) and current ratio (R) accordingly.
29. Driving apparatus according to claim 28, wherein the driving apparatus is provided with a mode selection switch coupled to said control input, the mode selection  
30 switch having two preferably three positions.
30. Driving apparatus according to claim 29, arranged to generate a commutating current with an average current intensity substantially equal to zero and a predetermined the

combination of duty cycle (D) and current ratio (R), said combination depending on the position of the mode selection switch (167) which is related to the orientation of the lamp.

31. Driving apparatus according to claim 30, wherein the duty cycle (D) has a predetermined first value ( $D_U$ ) differing from 50% when said mode selection switch (167) is placed in a first position (U) indicative of a standing orientation of the lamp, and wherein the duty cycle has a predetermined second value ( $D_D$ ) differing from 50% when said mode selection switch is placed in a second position indicative of a hanging orientation of the lamp (1);

10 and wherein  $D_D \neq D_U$ .

32. Driving apparatus according to claim 18, designed for driving a symmetrical lamp, wherein  $D_D = 100\% - D_U$ .

15 33. Driving apparatus according to claim 28, adapted for a variable particle distribution shift, wherein the driving apparatus is provided with a control setting device (152) coupled to said control input;

- wherein the control setting device (152) is arranged for generating a control signal ( $S_U$ ), which is continuously variable within a predetermined range;

20 - and wherein the driving apparatus is arranged to continuously vary the combination of duty cycle (D) and current ratio (R) of the commutating lamp current in response to said control signal.

34. Driving apparatus according to any of claims 24 to 32, adapted to generate said current with a duty cycle equal to 50% during a start phase of the lamp.

35. System with automatic orientation-independent efficacy capability, for driving a gas discharge lamp, specifically a HID lamp, more specifically a metal halide lamp, most specifically a metal halide lamp with an aspect ratio larger than 3 or even 4, the system being capable of operating a lamp with a substantially orientation-independent efficacy, the system comprising:

- a driver according to any of claims 24 to 33;

- a position detector (80) having at least one output coupled to the control input of the driver; the position detector being arranged for detecting the actual orientation of the lamp, and for generating at its said output a control signal indicative of such orientation.

5 36. System according to claim 34, wherein the driving apparatus is responsive to the position detector output signal to set the difference between duty cycle (D) and 50% depending on the position of the mode selection switch which is related to the orientation of the lamp.

10 37. System according to claim 34, wherein the driving apparatus is responsive to the position detector output signal to generate a duty cycle having a predetermined first value ( $D_U$ ) differing from 50% when said position detector output signal has a first value indicative of a standing orientation of the lamp, and wherein said driving apparatus is responsive to the position detector output signal to generate a duty cycle having a predetermined second value  
15 ( $D_D$ ) differing from 50% when said position detector output signal has a second value indicative of a hanging orientation of the lamp, and wherein  $D_D \neq D_U$ .

38. System according to claim 36, designed for driving a symmetrical lamp, wherein  $D_D = 100 \% - D_U$ .

20

39. System according to claim 34, further comprising a fitting (168) for receiving a lamp cap (12) of a lamp assembly (10), the fitting having contacts connected to output terminals of the commutator, wherein said position detector is associated with said fitting.